04-24-00

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Practitioner's Docket No. SAA-36 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of
Inventor(s): Richard A. Baker, Jr.

WARNING: *37 C.F.R. § 1.41(a)(1) points out:*

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): NETWORK ADDRESSING BASED ON PHYSICAL SITE LOCATION OR A NETWORK DEVICE

CERTIFICATION UNDER 37 C.F.R. 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date 4-20-2000 in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL 508 861 755 US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Judith Schick
(type or print name of person mailing paper)

Judith Schick
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

WARNING: *Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

1. Type of Application

This new application is for a(n)

(check one applicable item below)

- [x] Original (nonprovisional)
- [ ] Design
  - [ ] Plant

WARNING: *Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

WARNING: *Do not use this transmittal for the filing of a provisional application.*

NOTE: *If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.*

- [ ] Divisional.
- [ ] Continuation.
- [ ] Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. 119(e), 120, or 121)

NOTE: *A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. 112. Each prior application must also be:*

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: *If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.*

WARNING: *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. 120, 121 or 365(c), the 20–year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. 120, 121 or 365(c). (35 U.S.C. 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. 119, 365(a) or 365(b).) For a c–i–p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

WARNING: *When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).*

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

9 Pages of specification

4 Pages of claims

4 Sheets of drawing

WARNING: ***DO NOT*** *submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 CFR 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).*

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. 1.84(c)).

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. 1.84(b).

☐ formal

☐ informal

B. Other Papers Enclosed

2 Pages of declaration and power of attorney

1 Pages of abstract

____ Other

4. Additional papers enclosed

☐ Amendment to claims

☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☐ Information Disclosure Statement (37 C.F.R. 1.98)

☐ Form PTO–1449 (PTO/SB/08A and 08B)

☐ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative

☐ Special Comments

☐ Other

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)–(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)–(4).

☒ Enclosed

Executed by

(check **all** *applicable boxes)*

☒ inventor(s).

☐ legal representative of inventor(s). 37 CFR 1.42 or 1.43.

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 C.F.R. 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 CFR 1.16(e) can be filed subsequently).

☐ Showing that the filing is authorized.
(not required unless called into question. 37 CFR 1.41(d))

6. Inventorship Statement

WARNING: *If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.*

The inventorship for all the claims in this application are:

☒ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

- ☐ is submitted.
- ☐ will be submitted.

7. Language

NOTE: *An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of $130.00 required by 37 CFR 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 CFR 1.52(d).*

☒ English

☐ Non-English

- ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. 1.52(d).

8. Assignment

☒ An assignment of the invention to SCHNEIDER AUTOMATION INC.

- ☒ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☒ FORM PTO 1595 is also attached.
- ☐ will follow.

NOTE: *"If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).*

WARNING: *A newly executed "CERTIFICATE UNDER 37 CFR 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.*

9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☐ is (are) attached.

☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 CFR 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. 1.16)

A. ☒ Regular application

CLAIMS AS FILED				
Number filed	Number Extra		Rate	Basic Fee 37 C.F.R. 1.16(a) $690.00
Total Claims (37 CFR 1.16(c)) 27 – 20 =	7	×	$ 18.00	126.00
Independent Claims (37 CFR 1.16(b)) 4 – 3 =	1	×	$ 78.00	78.00
Multiple dependent claim(s), if any (37 CFR 1.16(d))		+	$260.00	

☐ Amendment cancelling extra claims is enclosed.

☐ Amendment deleting multiple-dependencies is enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 CFR 1.16(d).

Filing Fee Calculation $ 894.00

B. ☐ Design application ($330.00—37 CFR 1.16(f))

Filing Fee Calculation $_____

C. ☐ Plant application ($540.00—37 CFR 1.16(g))

Filing fee calculation $_____

11. Small Entity Statement(s)

☐ Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is (are) attached.

WARNING: "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

(complete the following, if applicable)

☐ Status as a small entity was claimed in prior application

_____ / _____, filed on _____, from which benefit is being claimed for this application under:

35 U.S.C. ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A, B** or **C** above)

$_____

NOTE: Any excess of the full fee paid will be refunded if small entity status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 CFR 1.28(a).

12. Request for International-Type Search (37 C.F.R. 1.104(d))

(complete, if applicable)

☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☐ Not Enclosed

☐ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Filing fee	$ 894.00
☒ Recording assignment ($40.00; 37 C.F.R. 1.21(h)) (See attached "COVER SHEET FOR ASSIGNMENT ACCOMPANYING NEW APPLICATION".)	$ 40.00
☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached ($130.00; 37 C.F.R. 1.47 and 1.17(i))	$
☐ For processing an application with a specification in a non-English language ($130.00; 37 C.F.R. 1.52(d) and 1.17(k))	$
☐ Processing and retention fee ($130.00; 37 C.F.R. 1.53(d) and 1.21(l))	$
☐ Fee for international-type search report ($40.00; 37 C.F.R. 1.21(e))	$

NOTE: 37 CFR 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 CFR 1.53(f) and this, as well as the changes to 37 CFR 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed $934.00

14. Method of Payment of Fees

☒ Check in the amount of $ 934.00

☐ Charge Account No. _____ in the amount of $_____.

A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 CFR 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: *If no fees are to be paid on filing, the following items should not be completed.*

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 23-0442 :

- ☒ 37 C.F.R. 1.16(a), (f) or (g) (filing fees)
- ☒ 37 C.F.R. 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☐ 37 C.F.R. 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☐ 37 C.F.R. §§ 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).
- ☐ 37 C.F.R. 1.17 (application processing fees)

NOTE: ". . .A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

- ☐ 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 CFR 1.311(b).

NOTE: 37 CFR 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . ." From the wording of 37 CFR 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

16. Instructions as to Overpayment

NOTE: ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ Credit Account No. 23-0442

☐ Refund

Kenneth Q. Lao

SIGNATURE OF PRACTITIONER

Reg. No. 40,061

Kenneth Q. Lao

(type or print name of attorney)

Tel. No. (203) 261-1234

WARE, FRESSOLA, VAN DER SLUYS & ADOLPHSON LLP

P.O. Address 755 Main Street, P.O. Box 224
Monroe, CT 06468-0224

Customer No. 4955

☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☐ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

☒ This transmittal ends with this page.

PATENT
SAA-36

UNITED STATES PATENT APPLICATION

of

Richard A. Baker, Jr.

for

NETWORK ADDRESSING BASED ON PHYSICAL SITE LOCATION OF A NETWORK DEVICE

EXPRESS MAIL NO. EL 508 861 755 US

NETWORK ADDRESSING BASED ON PHYSICAL SITE LOCATION OF A NETWORK DEVICE

Field of the Invention

The present invention relates generally to a method for communication among a plurality of devices in a communications network. In particular, it relates to establishing the address for each device.

Background of the Invention

A local area network system, such as the Ethernet, can be used for industrial control applications. Such a network system can be used to enable programmable controllers, host computers, control devices such as adjustable frequency drives, and other devices to communicate through the production areas of an industrial plant. The devices connected together in such a communication link are generally referred to as "nodes". Each node has a unique Media Access Control (MAC) address as an identifier of the node to allow messages from one node to be sent to another.

In an automation factory where a plurality of automation devices are used to perform a variety of intended functions, each automation device has a controller, such as a programmable logic controller (PLC), to communicate with a controlling workstation or the PLC of another automation device. Furthermore, the PLC includes a software program to control the automation device in performing the intended function. It is quite common that the automation devices are placed at physical site locations in accordance with their particular functions. Conventionally, each of the automation devices is identified by the MAC address (or an Internet Protocol (IP) address) given to the PLC of the automation device. The MAC address is a fixed address which is given to an Ethernet module of a PLC when it is manufactured or assigned by a user, and the MAC address is unrelated to the physical site location of the device. If the PLC at one location is replaced by another PLC, the device at that particular location will not operate until the new MAC address of the replacement PLC is associated with the old MAC address of the replaced PLC. This

addressing method is disadvantageous in a factory automation setting. If a problem develops with the device, maintenance must be performed by a professional who is skilled in networking management in order to associate the new MAC address with the old MAC address. This method is costly and can be time consuming.

It is, therefore, advantageous and desirable to provide a method and a network system wherein the need for the network management professional to be available for replacement of the factory device can be eliminated.

Summary of the Invention

One aspect of the present invention is a method of network addressing based on the physical site location of the network devices. The method includes the steps of identifying the physical site location of a network device and associating the physical site location to the device address so as to allow the device to communicate with other devices in the network.

Another aspect of the present invention is a network communications system having a plurality of devices, wherein one or more devices include means for identifying the physical location so that the physical location is used as an address of the device in order to allow the device to communicate with other devices in the communication system. Preferably, a software program is used to convert a map of physical locations of the devices into an address table required for routing messages to these devices.

Accordingly, a further aspect of the present invention is a device to be used in a network communications system wherein the device includes means for identifying its own physical location so that the physical location can be used as an address of the device in order to allow the device to communicate with other devices in the network communications system.

The present invention will become apparent upon reading the descriptions taken in conjunction with Figures 1-4.

Brief Description of the Drawings

Figure 1 is a block diagram showing a network communications system.

Figure 2 is a block diagram showing a network device.

Figure 3 is a block diagram showing a network communications system wherein a plurality of network devices share one physical location.

Figure 4 is a block diagram showing a mapping method for relating a physical location to the address of a network device.

Detailed Description of the Invention

The network communications system of the present invention is shown in Figure 1. As shown, the communications system **10** includes a plurality of network devices **101-105**. Each of the network devices **101-105** is placed at one of the different physical locations **201-205**, connected by a communication link **20**. As shown in Figure 2, each device has a controller such as a programmable logic controller (PLC) **116** for controlling the device in carrying out the intended function thereof. Preferably, the communications system **10** is a modified local area network (LAN) wherein the address of each device to be used for communication purposes is associated with the physical site location of the device, rather than a Media Access Control (MAC) or an Internet Protocol (IP) address that is usually given to a PLC or to an input device of a PLC system. The network communications system can be any wired or wireless network that uses electrical signals, optical signals or other form of message signals to convey messages between devices in the system. The network communications system can also include one or more wide area networks (WANs). One of the network devices **101-105** may be a workstation or a master module to oversee the overall operations of the network communications system.

Figure 2 shows the components in a typical network device **100**, representative of the network devices **101-105** shown in Figure 1. As shown in Figure 2, the network device **100** includes an I/O interface **122** for exchange signals or data with a machine or a monitoring apparatus; a network interface **112** to exchange signals or data with other

network devices in a network communications system; a physical site locator **114** residing inside or outside the network interface **112** to identify the physical location of the network device **100**; and a programmable logic PLC **116** to control the machine or monitoring apparatus to which the network device **100** is connected using an application program **120** stored in a memory unit **118**. These components can communicate with each other and other network devices **100** through a bus in the backplane **124**.

In a factory automation system where a variety of automation machines are organized into a network communications system, and each automation machine is controlled by a network device **100**, each machine may have a particular function to perform. For example, one machine may perform a metal stamping function while another performs metal surface polishing in an assembly line environment. Thus, the network device **100** connected to each automation machine includes an application program **120** to control the machine. In order for the machine to carry out the intended function in a timely manner, the network device **100** must have the ability to communicate with other network devices in the system.

It should be noted that, in some applications, the machines connected to a network are required to perform different functions. But in other applications, all machines can be used to perform the same function. For example, in a pipeline where batches of refined petroleum products are transported within a transport pipe from one state to another, a number of instruments are used at different locations along the pipeline to monitor the flow rate, fluid pressure and the content of the passing batch. Thus, all the monitoring instruments and the application program therefor can be identical. The only difference is the location of the monitoring instruments. In this type of the application, it is especially advantageous to use the physical site location as the address of each monitoring instrument.

In general, when the automation factory is designed, the industrial engineer works off of a floor plan. The floor plan is refined to an individual machine and to the physical site location of the machine. This physical location becomes the identifier of the unit or the address of the network device in the communications system. Once the automation machines are installed according to the floor plan, a software program is used to tie the

location on the floor plan to the location of the automation machine as identified by the physical site locator **114** of the network device **100** to which the automation machine is connected. Because the physical site locator **114** only recognizes the location of the machine and not the function of the machine, the network device **100** connected to one machine can be identical to the network device **100** connected to another machine. Thus, all network devices **101-105** as shown in Figure 1 can be identical. Once identified, all control or application programs and configuration information needed for an automation machine placed at a particular location to perform an assigned function can be downloaded from a master module, for example, to the PLC **116** of the network device **100**. Preferably, a mapping software program is used to convert a map of the physical site locations of the network devices into one or more address tables required to route messages to these network devices. With such a mapping software program, the physical locator of a network device functions like the MAC address of the device regarding the routing of messages in a network. The mapping software will be described in conjunction with Figure 4.

If a problem develops with a network device **100** on a certain automation machine, that network device **100** can be replaced with another network device **100**. Likewise, if a problem develops with a certain automation machine, it can be replaced with another similar machine, with or without changing the network device **100**. Once the replacement is completed, the programs and configuration information can be downloaded again according to the physical site location as identified by the physical site locator of the replacement network device. Because the physical location of the automation machine remains the same, the programs and configuration information downloaded to control the automation machine will always be the same. Replacing a machine with a similar machine or replacing a network device on a machine does not require the skill of a professional in the field of network management. Thus, the maintenance of an automation factory can be greatly simplified and can be carried out in a cost-effective fashion.

As an additional benefit of the present invention, the location information in a hard wired factory can be used as a safety check to assure that the program in the PLC is intended to be operated at the location of the machine. It is not uncommon where a user

places the wrong PLC program into a PLC and the wrong PLC causes an unintended operation. By double-checking the physical location, most mistakes of this type can be eliminated.

The physical site locator **114** is known in the art. Personal locator technology, such as the Global Position System (GPS), a Time Difference Of Arrival (TDOA) device, or another Personal Locator System (PLS) can be used to identify the location of the network device **100** in which the physical site locator is included. However, each of these locator devices or systems has a location resolution beyond which the locator is unable to resolve. For example, a location resolution of 5 foot squared or better may be impractical in a factory automation setting where two or more machines are located closely together. In a different embodiment of the present invention as shown in Figure 3, one physical locator can be shared with a group of machines located in a small footprint. As shown in Figure 3, a network **10'** comprises a group of network devices **101, 105, 106, 107** and **108**, and a controlling workstation **119**. While the devices **101** and **105** are separately positioned in physical locations **201** and **205**, respectively, the devices **106-108** are located in the same physical location **206** to be associated with three machines. The shared physical locator is, for example, associated with one of the PLCs that controls the machines in the physical location **206**. Thus, not all the network devices **106-108** have to use a physical site locator **114**. However, the PLC **116** (see Figure 2) in each of the network devices **106-108** must have its own MAC address, IP address or another network address. When a PLC **116** is powered on, it learns its location from the shared physical locator and then transmits a message, providing both its MAC address and the shared physical location to the controlling workstation **109**. A software program in the controlling workstation **109** would then translate this message in order to map the floor plan with the provided MAC addresses for the associated machines. As such, the controlling workstation **109** or another device can download an appropriate application program to the PLC, and the PLC would start with the application program intended for a network device in the shared location. It is possible that the message transmitted from a PLC **116** to the controlling workstation **109** is a Reverse Address Request Protocol (RARP) message.

Whether each network device **100** is positioned in a different physical site location as shown in Figure 1, or a number of network devices **100** share a physical site location as shown in Figure 3, it is advantageous to link a map of the physical locations to one or more address tables for routing messages to or from the network devices. Such a mapping method is shown in Figure 4. As shown in Figure 4, a map **300** having six different physical locations is related to an address table **310** having six different network addresses. For example, physical location 1 is associated with network address 1, etc. Depending on the communications network, the network address can be a MAC address, an IP address or another address type. The mapping between the physical location and the network address can be carried out by a software program in the master module, for example.

The method, the network device and the network communications system, according to the present invention, can be applied to a variety of monitoring programs. For example, a utility company can use the network device associated with a power meter to remotely read out the power meter at any location without the need of identifying the power meter. The network device can be programmed to automatically convey information including its physical location and the meter reading to the utility company according to the stored instruction. Similarly, a pipeline company can monitor the flow of the feed-stock at desired locations and time intervals. A water company can monitor water usage for billing and leak detection. A mining company can use a plurality of network devices, which can be moved to different locations if desired, to report the status of air quality or water levels. Network devices can be installed along with various monitoring instruments at various locations in a building to read out local temperature, humidity, air quality, lighting condition, etc. The present invention can also be applied to home automation in a smaller scale. Again, if a problem develops with a network device, any unskilled personnel can replace the network device.

Thus, the present invention has been described with respect to the preferred embodiments thereof. It will be understood by those skilled in the art that numerous changes and deviations in the form and detail thereof may be made without departing from the spirit and scope of the present invention. For example, the network communications system as depicted in Figure 1 can be replaced by a wireless network, or a network with a

plurality of gateways and bridges. Similarly, the device as depicted in Figure 2 can be modified to include more components or to reduce the number of components. However, these variations do not depart from the scope of the present invention wherein network addressing is based, partly or completely, on the physical site location of the devices in the network.

What is claimed is:

1. A method of communicating with a device in a network communications system wherein the device is positioned at a physical location, said method comprising the step of identifying the physical location of the device so that the physical location can be used as an address of the device in the network communications system.

2. The method of claim 1, wherein the address of the device is a MAC address.

3. The method of claim 1, wherein the address of the device is an IP address.

4. The method of claim 1, further comprising the step of transmitting from the device the physical location and the address thereof to a controlling station so as to allow the controlling station to associate the physical location to the address for conveying signals to the device.

5. The method of claim 4, wherein the device has an intended function controlled by a software program, said method further comprising the step of loading the software program from the controlling station to the device after the physical location of the device is identified.

6. A method of communicating with a plurality of devices in a network communications system wherein each device is positioned at a physical location, said method comprising the step of converting a map of the physical locations of the devices into one or more address tables, each table including a plurality of network addresses for routing messages to the devices.

7. The method of claim 6, wherein a controlling station is used to associate the physical location to the network address of the respective device.

8. The method of claim 7, wherein each device comprises:

a programmable logic controller having a network address assigned thereto to communicate with the controlling station; and

a physical site locator to identify the physical location of the respective device.

9. The method of claim 7, wherein each device comprises:

an I/O device of a programmable logic controller system having a network address assigned thereto to communicate with the controlling station; and

a physical site locator to identify the physical location of the respective device.

10. The method of claim 6, wherein a software program is used to convert the map of the physical locations into the address tables.

11. A network communications system comprising a plurality of devices positioned at a plurality of physical locations, said system comprising means for identifying the physical locations of the devices so that each of the physical locations can be used as an address of a respective device in order to allow the devices to communicate with each other in the network communications system.

12. The network communications system of claim 11, further comprising means for converting a map of the physical locations into one or more address tables in order to route messages to the devices.

13. The network communications system of claim 11, further comprising a controlling station to receive messages containing the physical locations and associate the physical locations to the addresses of the devices.

14. The network communications system of claim 11, further comprising a local area network (LAN).

15. The network communications system of claim 11, further comprising a wide area network (WAN).

16. The network communications system of claim 11, further comprising a wireless access communications system.

17. The network communications system of claim 11, wherein each device has a unique physical location.

18. The network communications system of claim 11, wherein a plurality of devices share one of the physical locations.

19. The network communications system of claim 18, wherein each device has a MAC address and means for transmitting the MAC address and the shared physical location in a RARP message to a controlling station in order to establish the address of the device in the network communications system.

20. The network communications system of claim 18, wherein each device has an IP address and means for transmitting the IP address and the shared physical location in a RARP message to a controlling station in order to establish the address of the device in the network communications system.

21. A device located at a physical site in a network communications system comprising means for identifying the physical site location so that the physical site location can be used as an address for communicating with other devices in the communication system.

22. The device of claim 21, wherein the identifying means comprises a GPS site locator.

23. The device of claim 21, wherein the identifying means comprises a TDOA device.

24. The device of claim 21, further comprising means for storing a program in order to carry out an intended function.

25. The device of claim 21, wherein the network communications system is used to perform a plurality of tasks, said device further comprising means to convey signals to an apparatus connected to the device for performing a task.

26. The device of claim 25, wherein the network communications system comprises a controlling station to oversee the tasks and wherein the signal conveying means comprises a programmable logic controller to communicate with the controlling station.

27. The device of claim 25, further comprising means for storing a software program to carry out the task to be performed by the apparatus.

Abstract of the Disclosure

A method of network addressing based on the physical location of the devices in a network communications system. Accordingly, each the devices in the network communications system is equipped with a physical site locator to identify the physical location of the device so that the physical location can be used as an address to allow the device to communicate with other devices in the network. Preferably, a mapping method is used to convert a map of physical locations to one or more address tables so as to allow a controlling station to route messages to and from the devices based on the physical locations. In a network where each network device has an intended function controlled by an application program, it is preferable that the application program is loaded onto the device after the physical location of the device is identified.

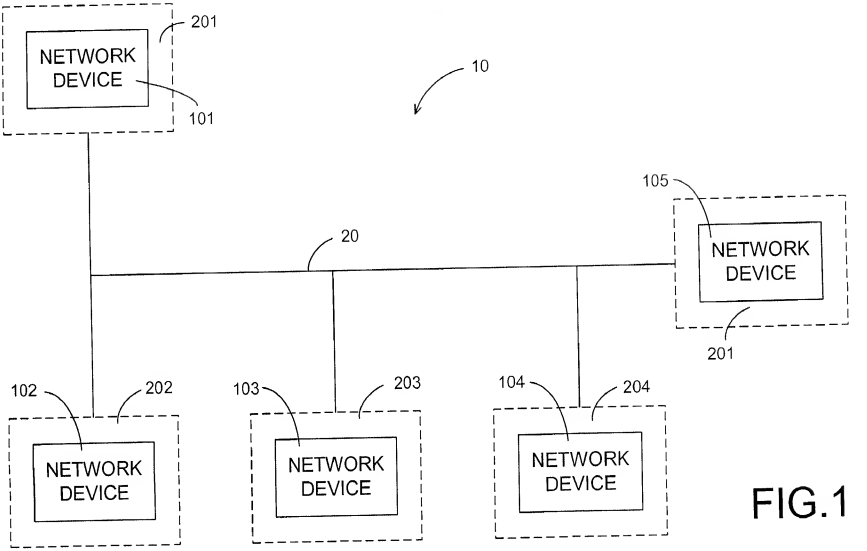

FIG.1

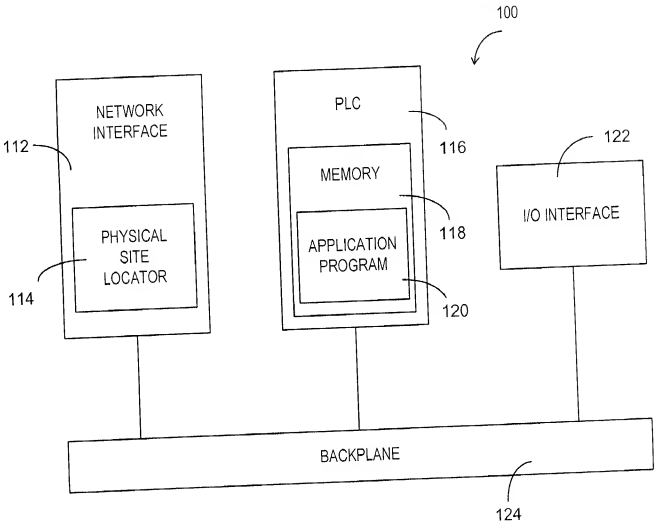

FIG. 2

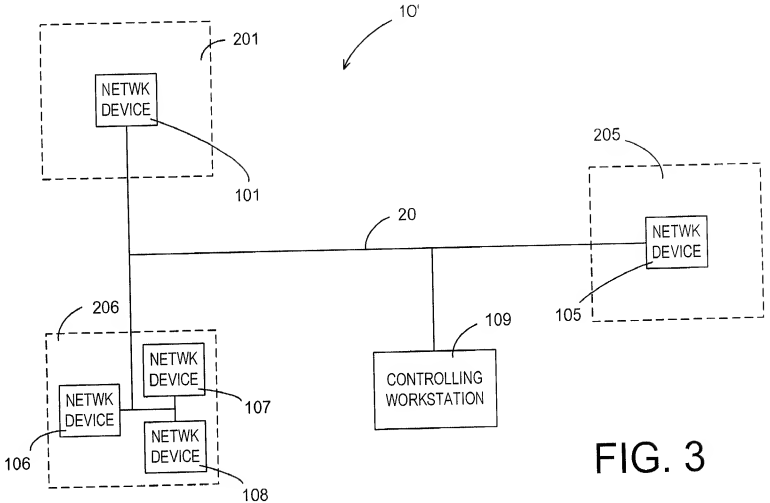

FIG. 3

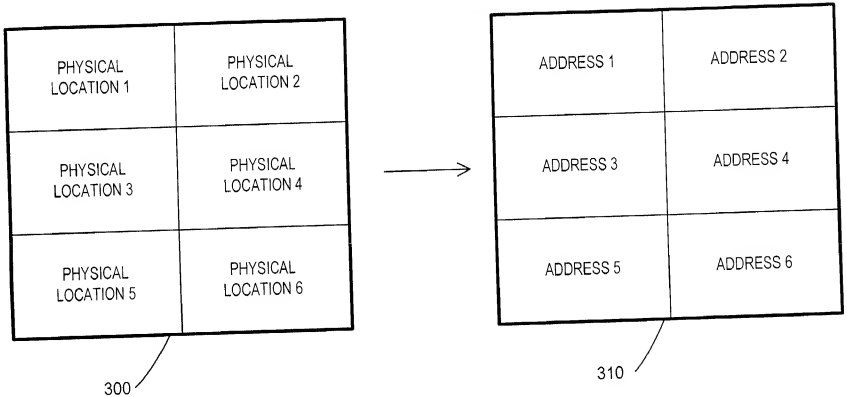

FIG. 4

Docket No. SAA-36 **DECLARATION AND POWER OF ATTORNEY** **PATENT**

As a below-named inventor, I hereby declare that:

(1) My residence, post office address and citizenship are as stated below next to my name.

(2) The below-named inventor(s) is/are the original, first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled "NETWORK ADDRESSING BASED ON PHYSICAL SITE LOCATION OF A NETWORK DEVICE" Attorney Docket No. SAA-36, the specification of which:

__X__ is attached hereto.

_____ was filed on _____as Application Serial No._____.

(3) I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

(4) I acknowledge the duty to disclose all information known to me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

(5) I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor certificate listed below and have also identified below any foreign application for patent or inventor certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

			Priority Claimed
(Number)	(Country)	(Day/Month/Year Filed)	Yes or No
			Priority Claimed
(Number)	(Country)	(Day/Month/Year Filed)	Yes or No

(6) I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a), regarding events which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status)
(Application Serial No.)	(Filing Date)	(Status)

(7) I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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(8) I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are delivered to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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(First) (Initial) (Last)

Inventor's Signature: _____

Date of Execution: _____

Residence: _____
(Include number, street name, city, state, and country)

Citizenship: _____

Post Office Address: _____
(If different from Residence Address)